



US008205770B2

(12) **United States Patent**
Lazalier et al.

(10) **Patent No.:** **US 8,205,770 B2**
(45) **Date of Patent:** **Jun. 26, 2012**

(54) **VENDING MACHINE USER INTERFACE GUIDE; ELECTRONIC COIN RETURN; AND HINGED DELIVERY BIN**

(75) Inventors: **Ray Melton Lazalier**, Lake Saint Louis, MO (US); **Jack Edward Anderson**, St. Louis, MO (US); **Martin Shawn Egan**, Bridgeton, MO (US); **David Aguirre**, Springfield, MO (US); **Gerald Joseph Podgorny**, St. Louis, MO (US); **Sachin Gopal Nagane**, St. Charles, MO (US); **Ignacio Santa Cruz**, St. Louis, MO (US); **Ronald Henry Krob, Jr.**, University City, MO (US)

(73) Assignee: **Crane Merchandising Systems, Inc.**, Bridgeton, MO (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 348 days.

(21) Appl. No.: **12/544,911**

(22) Filed: **Aug. 20, 2009**

(65) **Prior Publication Data**

US 2010/0084421 A1 Apr. 8, 2010

Related U.S. Application Data

(60) Provisional application No. 61/196,465, filed on Oct. 17, 2008, provisional application No. 61/189,647, filed on Aug. 21, 2008.

(51) **Int. Cl.**
A47F 1/00 (2006.01)

(52) **U.S. Cl.** **221/100; 221/97; 221/125; 221/126; 221/282; 221/285**

(58) **Field of Classification Search** 221/125, 221/126, 97, 100, 282, 285
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,040,510	A	8/1977	Peters et al.	
5,722,882	A	3/1998	Kashiwagi et al.	
6,170,285	B1 *	1/2001	Huffman et al.	221/150 R
6,193,154	B1	2/2001	Phillips et al.	
6,772,048	B1	8/2004	Leibu et al.	
7,128,239	B2 *	10/2006	Skavnak	221/221
7,222,749	B2 *	5/2007	Holdway et al.	221/196
2005/0199644	A1 *	9/2005	Pensenti Barili et al.	221/90

OTHER PUBLICATIONS

Notification of Transmittal of the International Search Report and the Written Opinion of the International Searching Authority, or the Declaration dated Mar. 10, 2010 in connection with PCT Application No. PCT/US2009/054659.

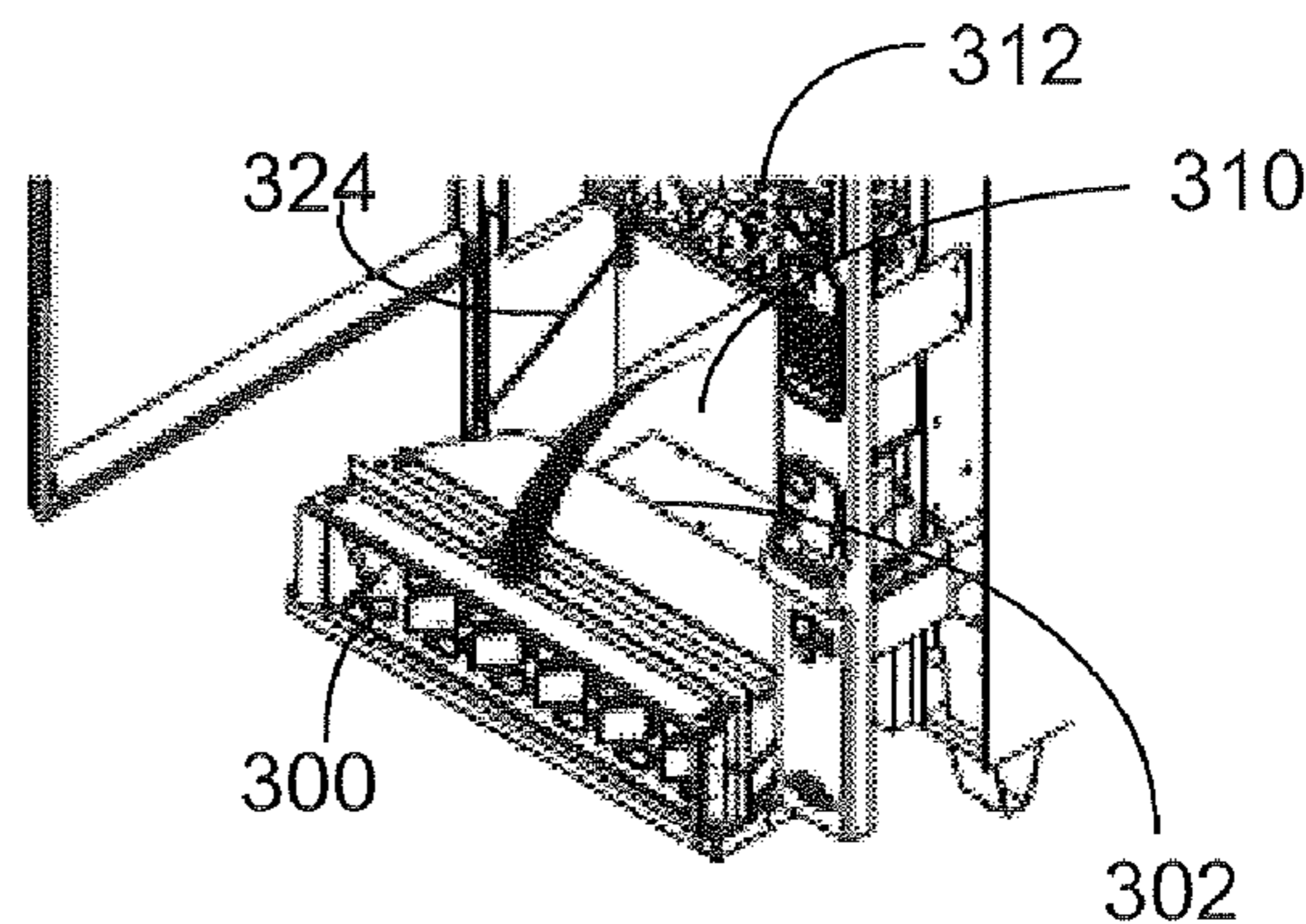
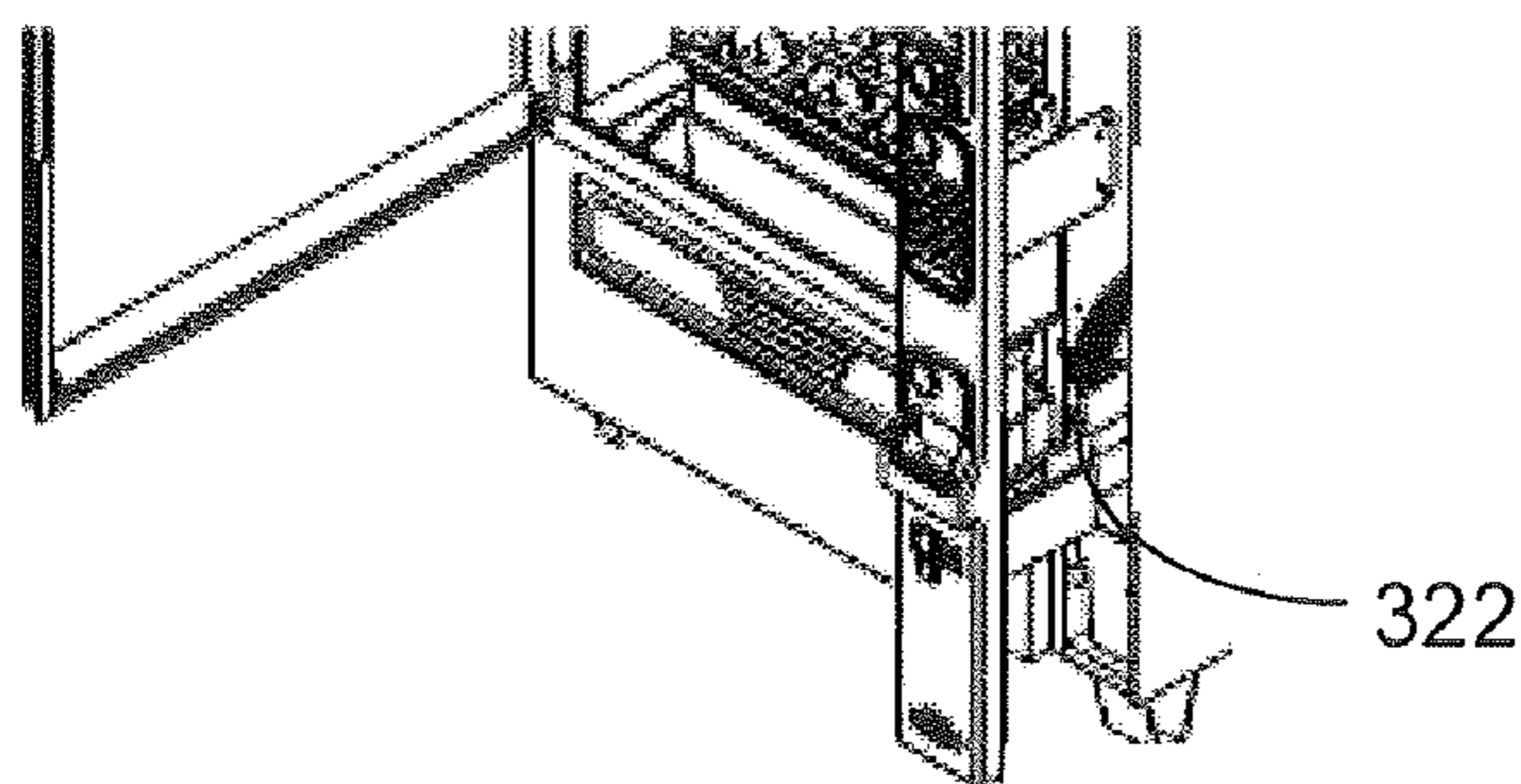
* cited by examiner

Primary Examiner — Timothy Waggoner

(57) **ABSTRACT**

A system and method for directing a consumer through a vending machine transaction. The system and method include a UI guide comprising visual cues to direct a consumer to insert a minimum amount of money, make a production selection and confirm the product selection. The system and method provide for the consumer to cancel the transaction and request that return of inserted coins.

20 Claims, 8 Drawing Sheets



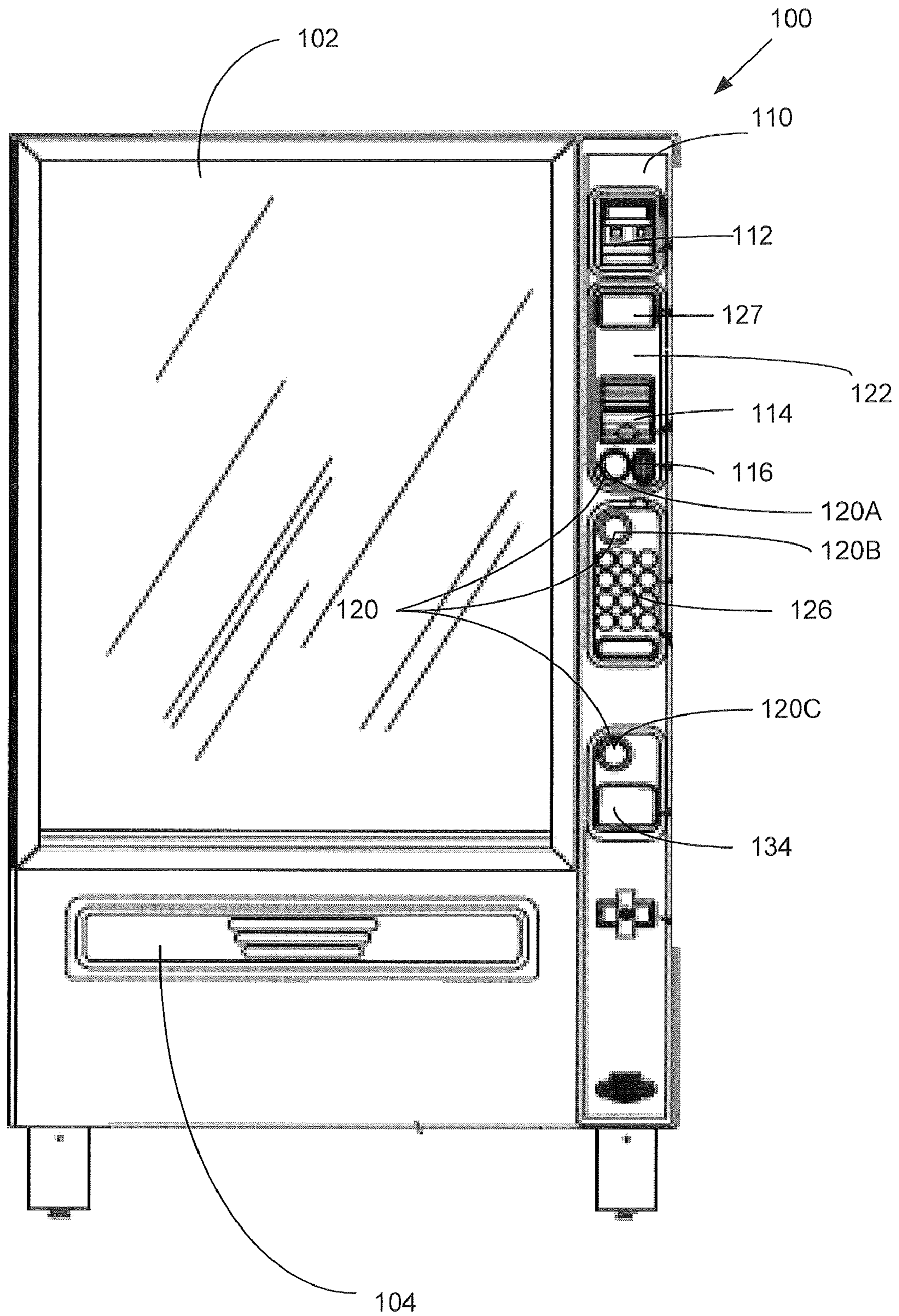


Figure 1a

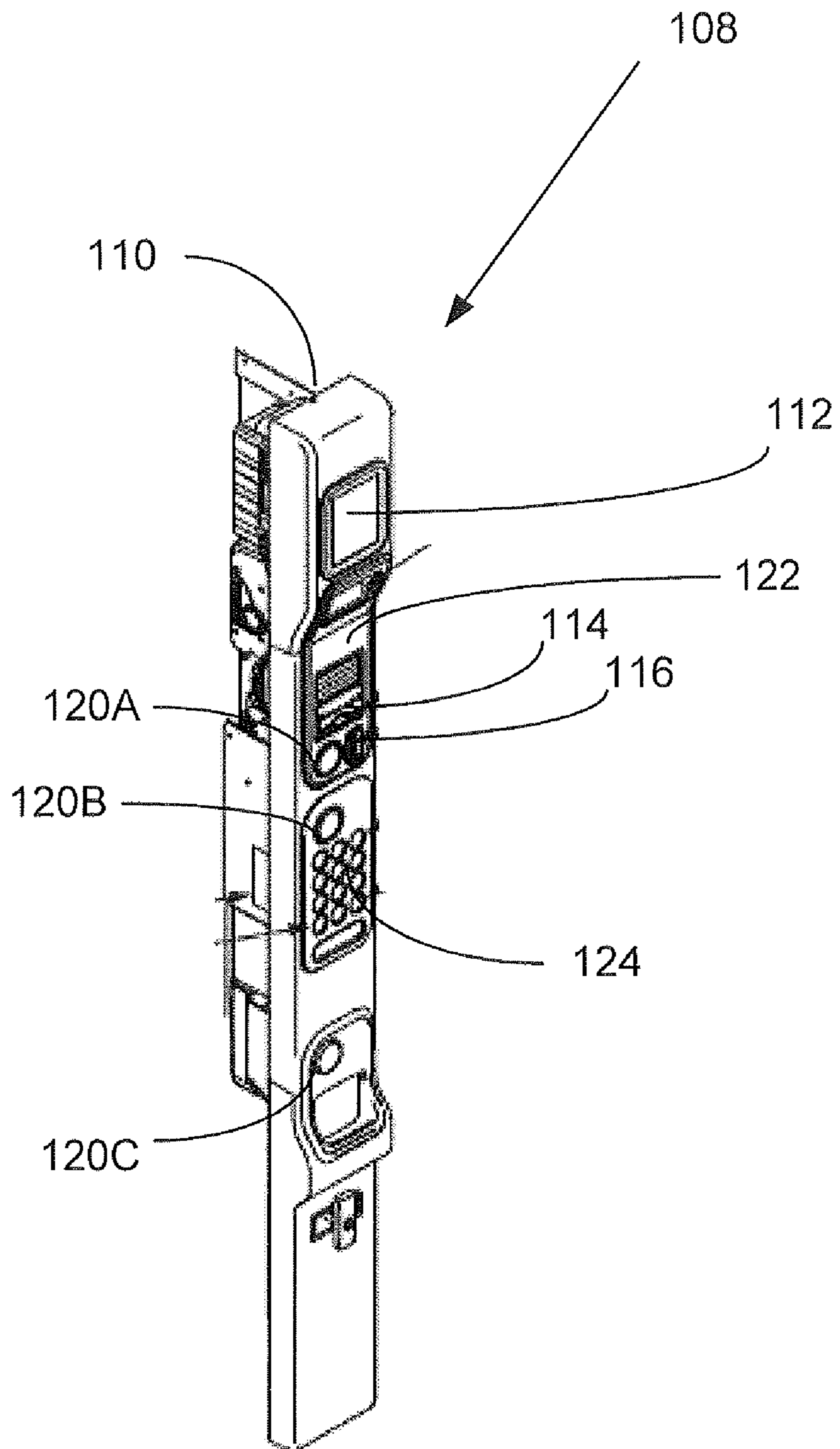


Figure 1b

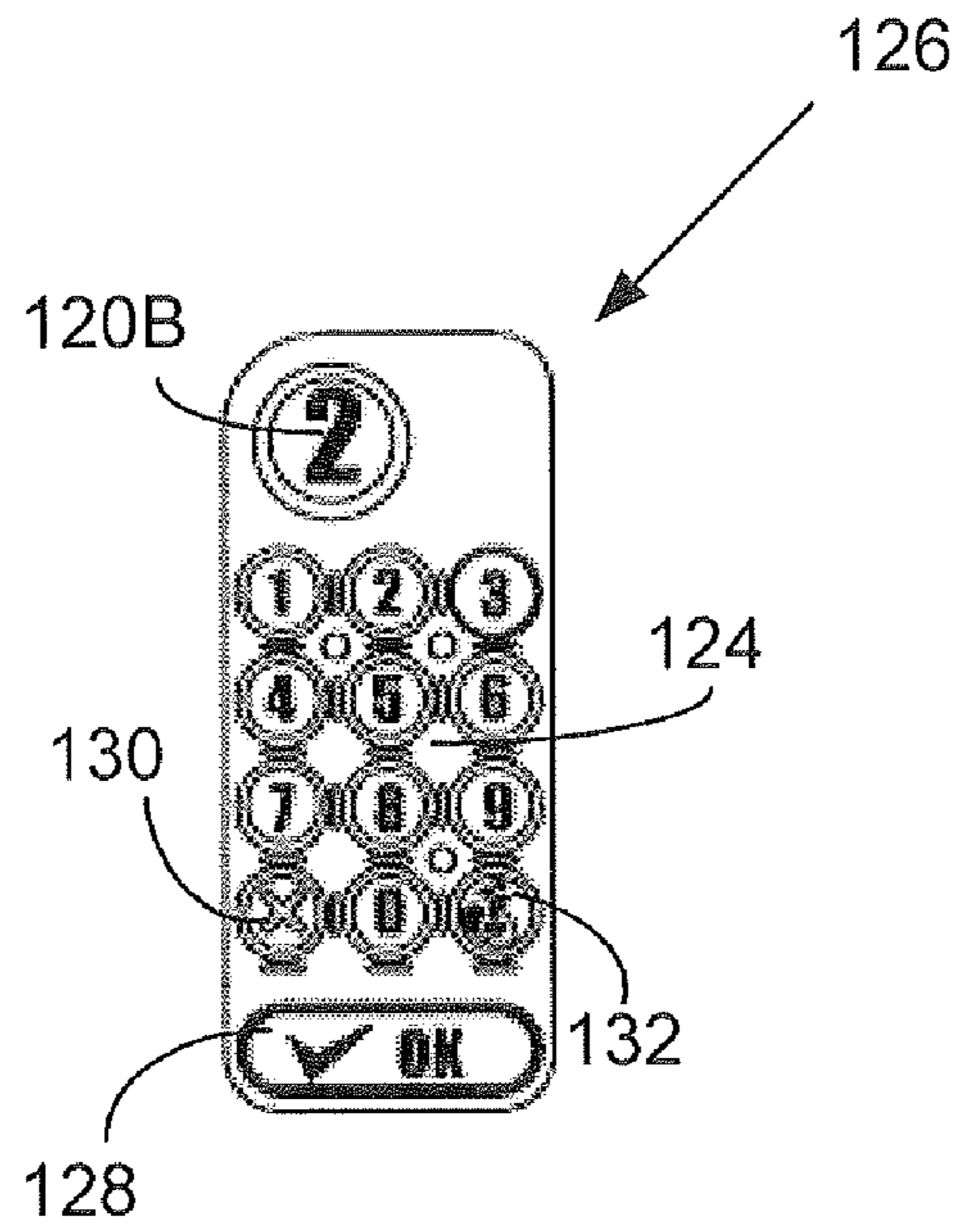


Figure 1c

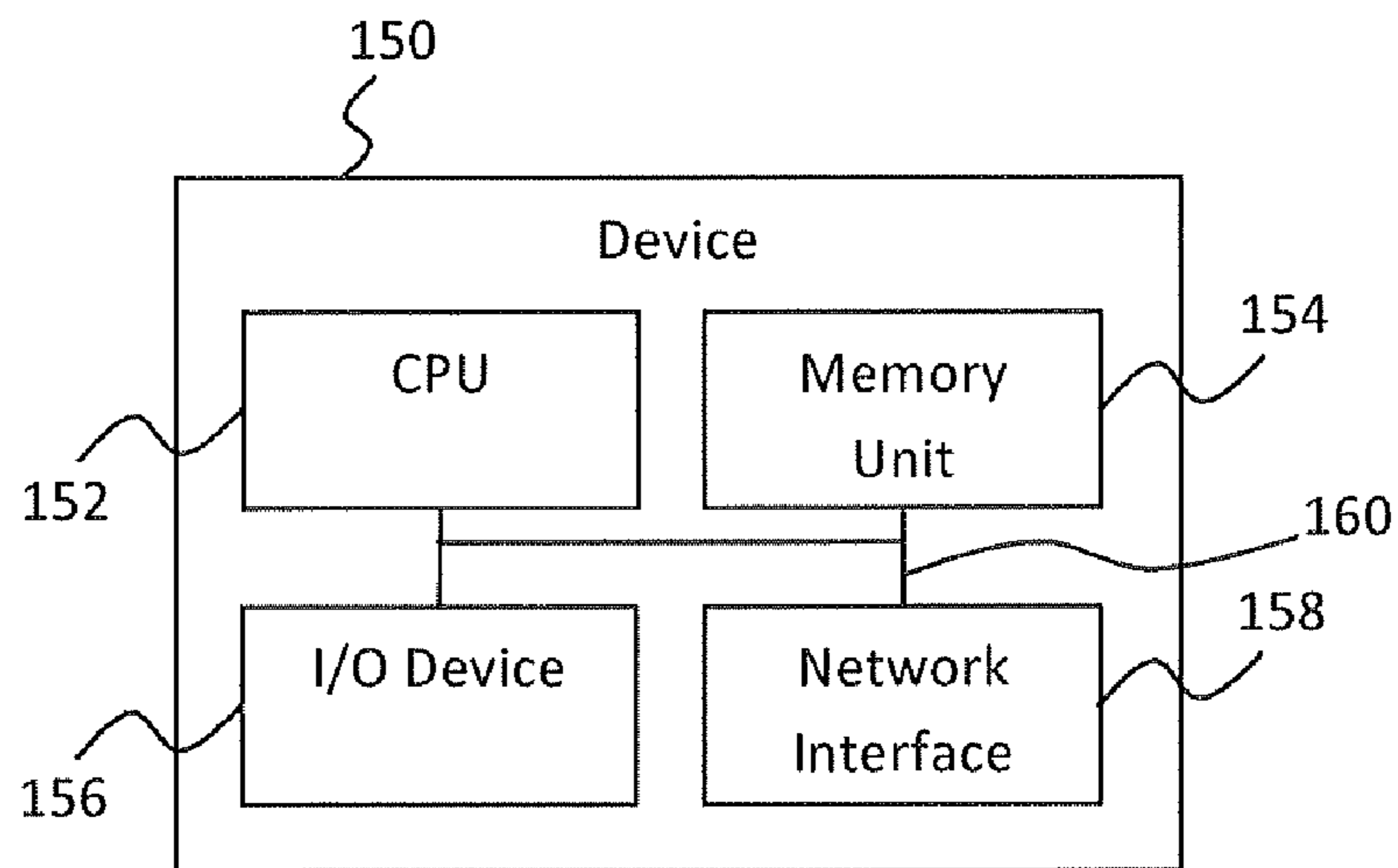


Figure 1d

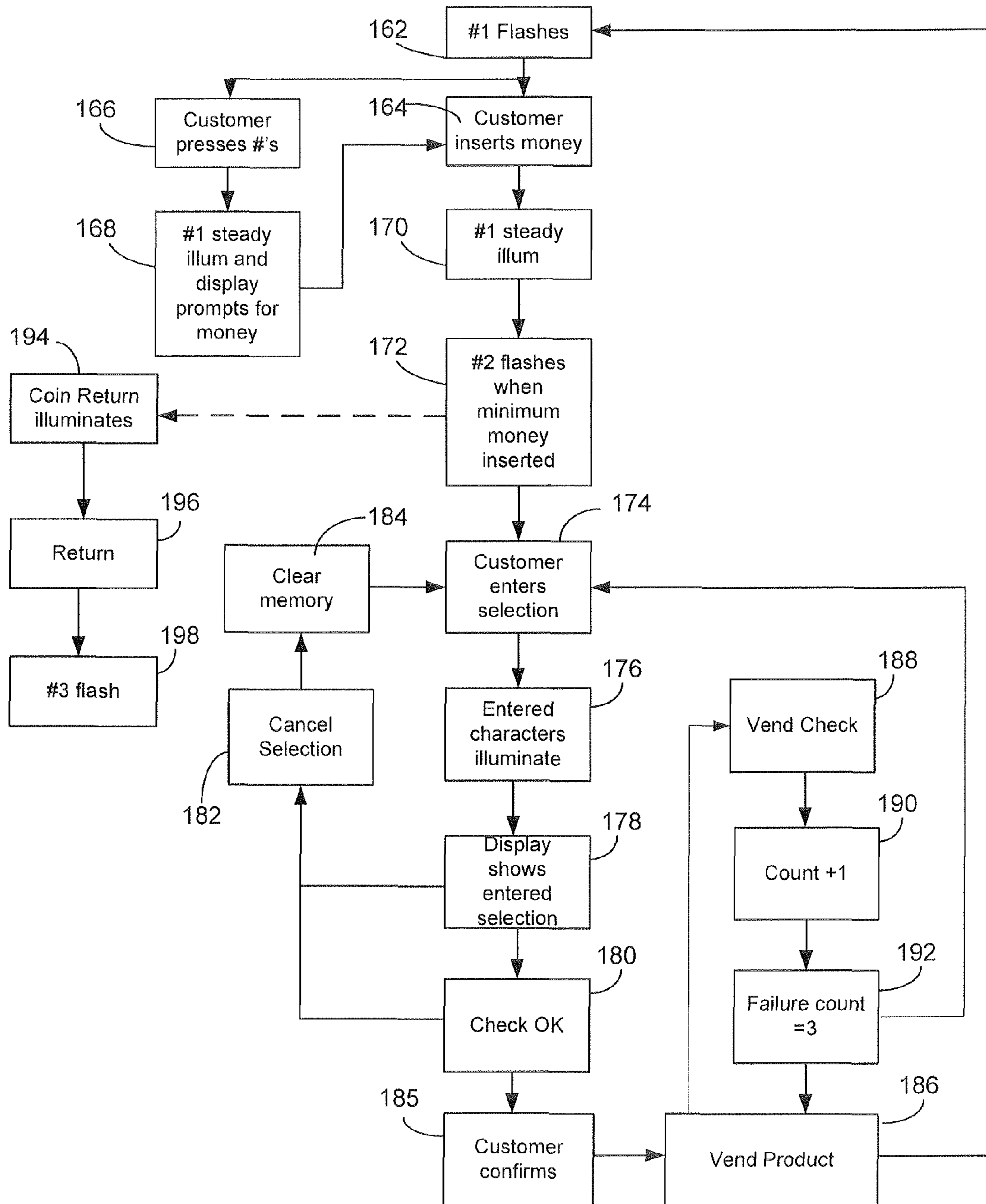


Figure 1e

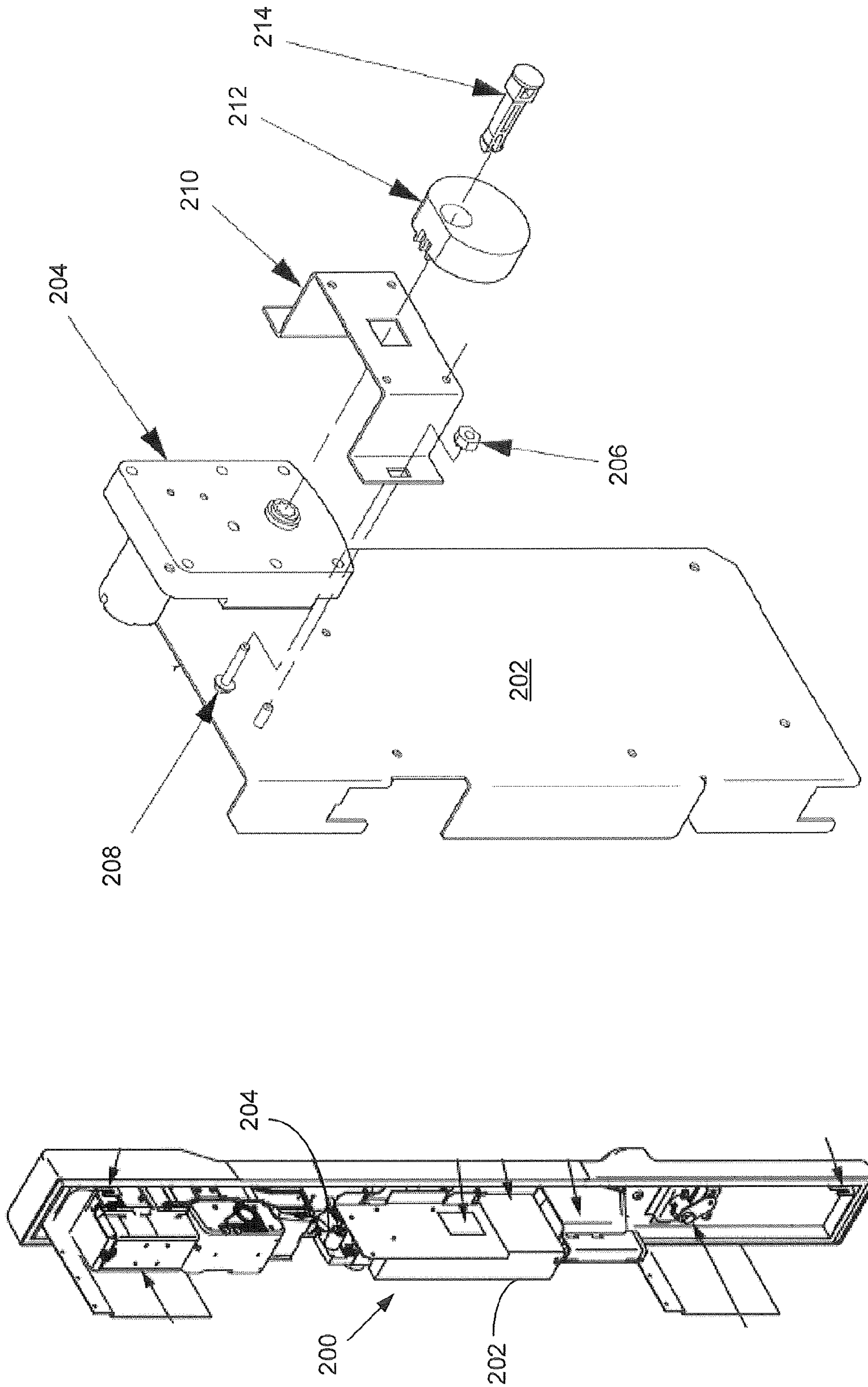


Figure 2b

Figure 2a

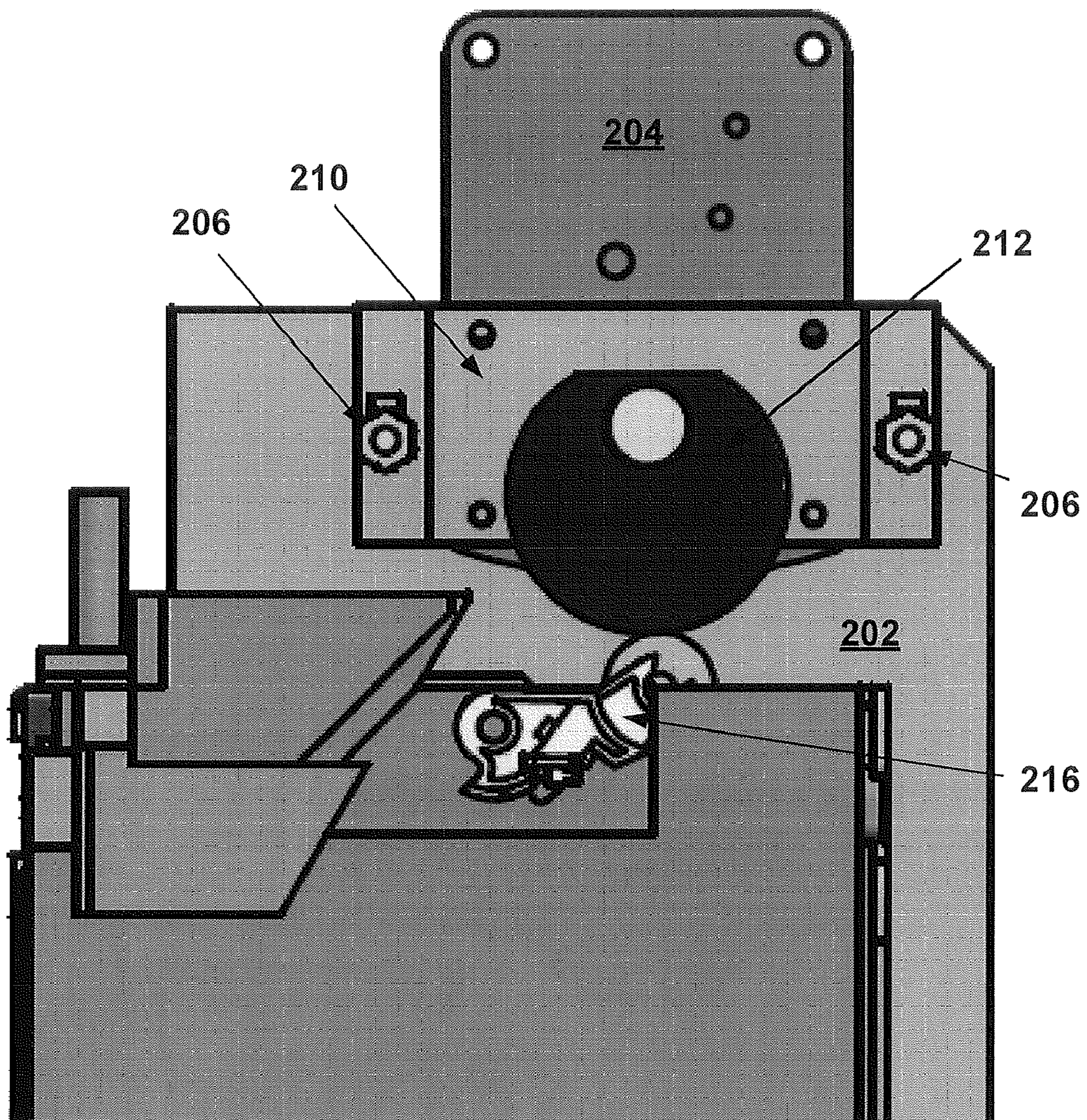


Figure 2c

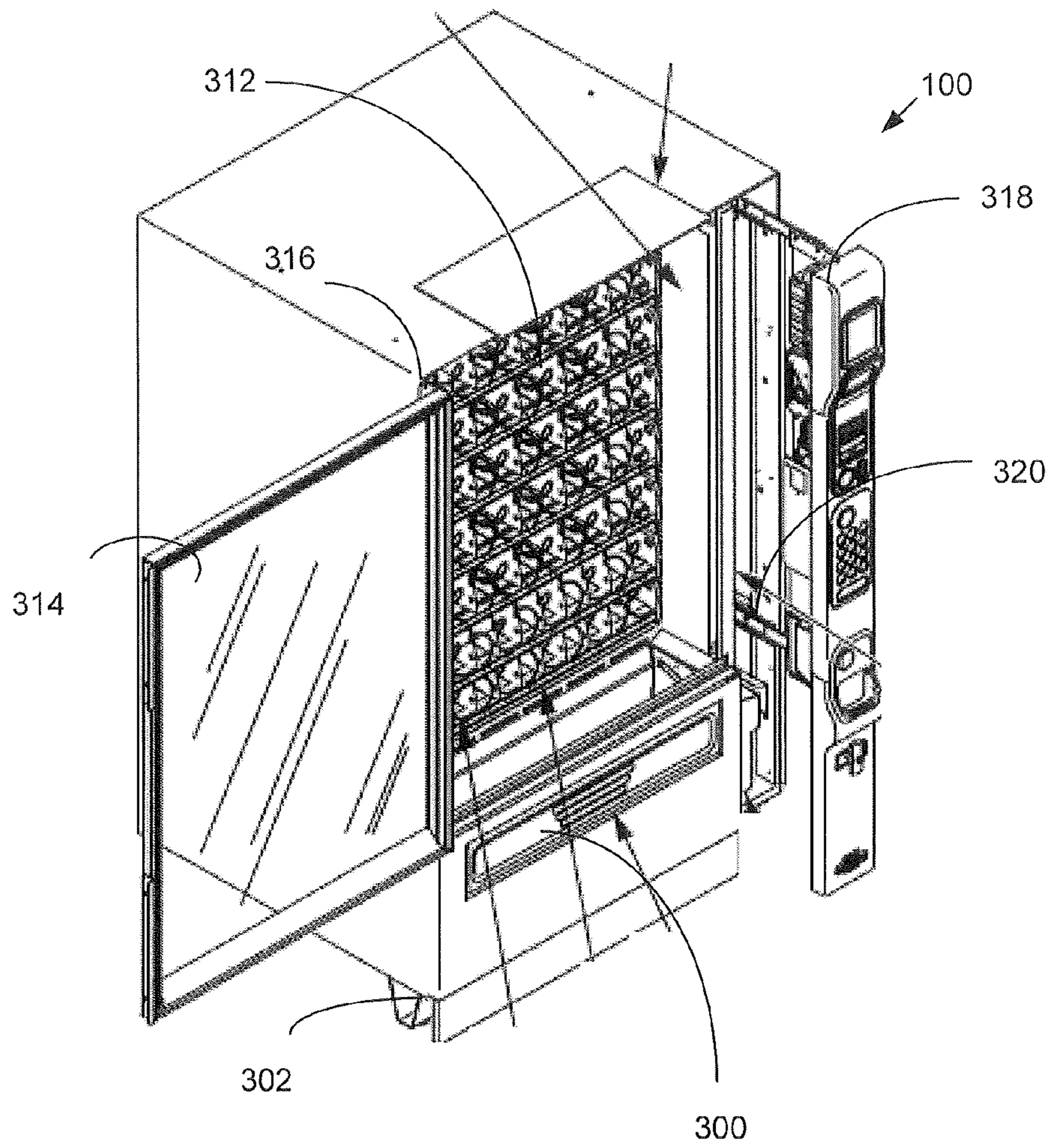


Figure 3a

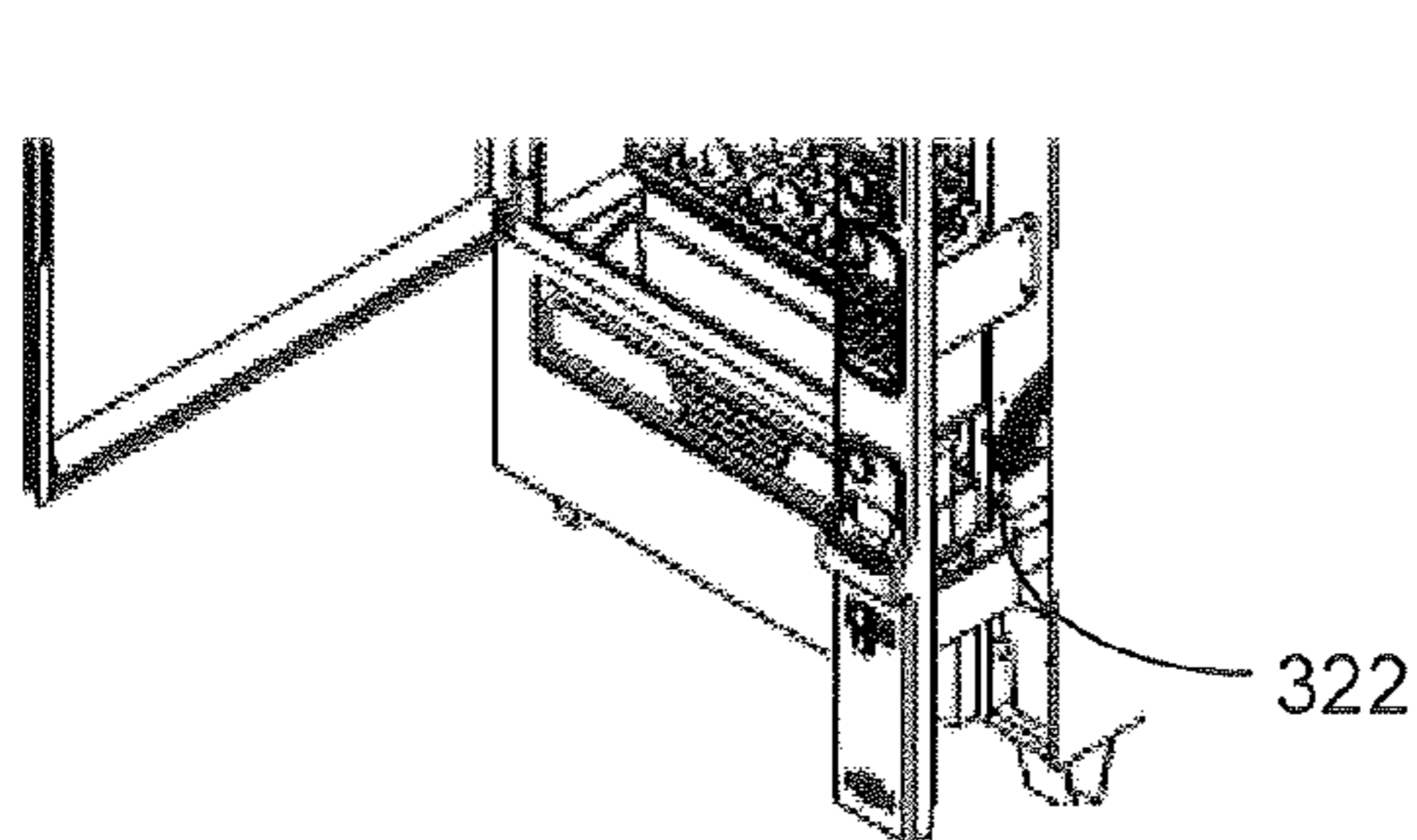


Figure 3b

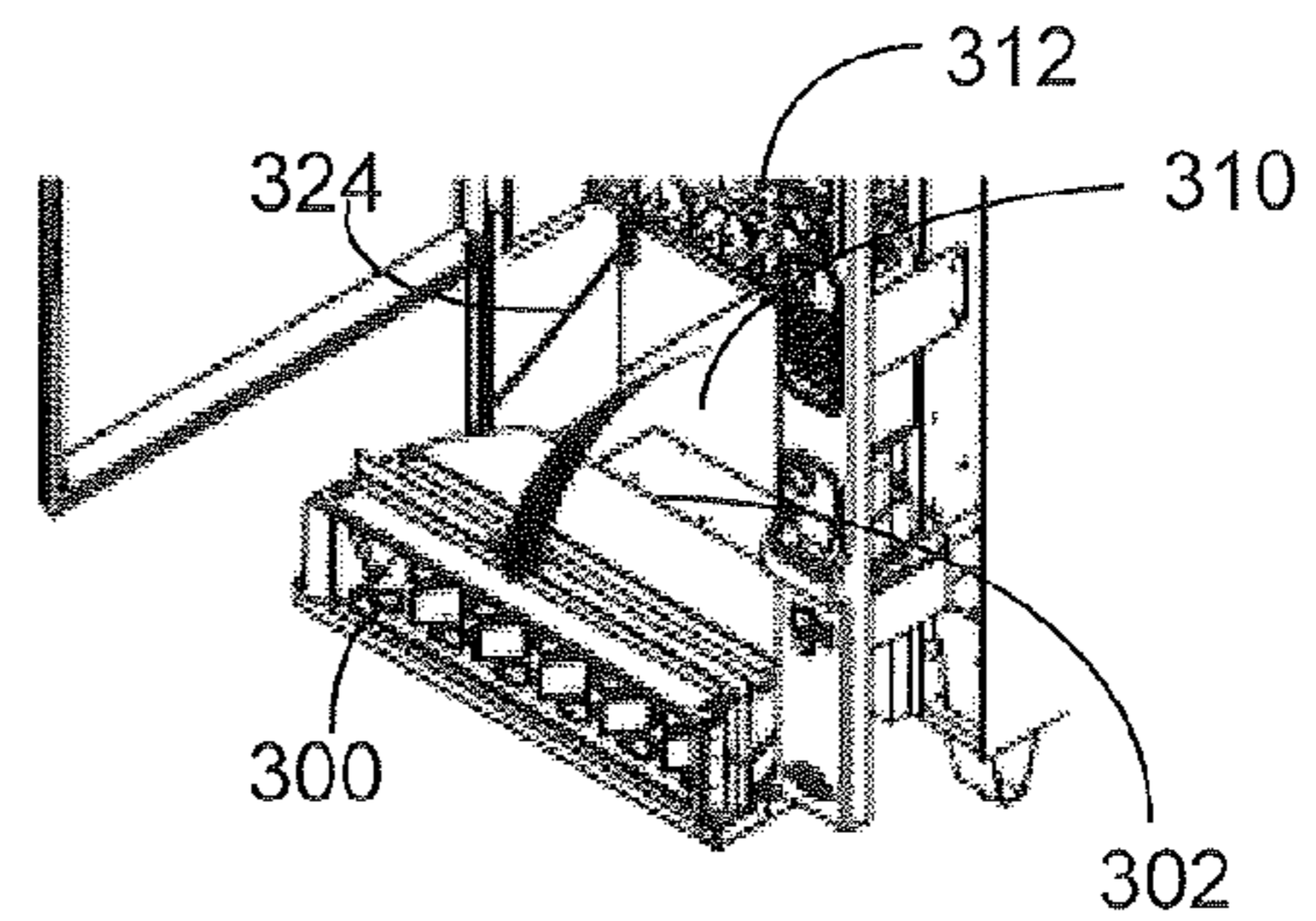


Figure 3c

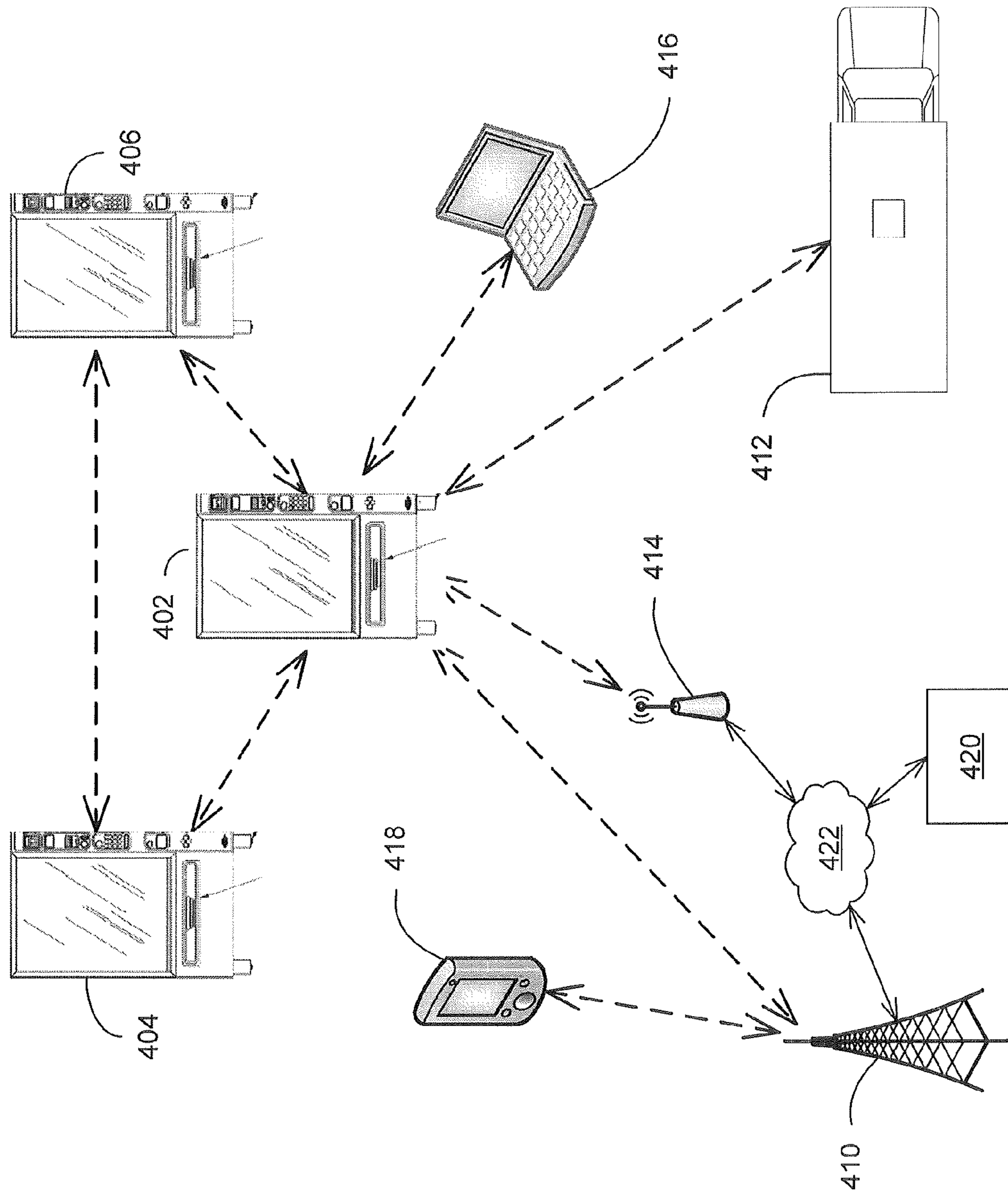


FIGURE 4

**VENDING MACHINE USER INTERFACE
GUIDE; ELECTRONIC COIN RETURN; AND
HINGED DELIVERY BIN**

CROSS-REFERENCE TO RELATED
APPLICATION(S) AND CLAIM OF PRIORITY

The present application is related to U.S. Provisional Patent No. 61/189,647, filed Aug. 21, 2008, entitled "VENDING MACHINE USER INTERFACE GUIDE; ELECTRONIC COIN RETURN; AND HINGED DELIVERY BIN". Provisional Patent No. 61/189,647 is assigned to the assignee of the present application and is hereby incorporated by reference into the present application as if fully set forth herein. The present application hereby claims priority under 35 U.S.C. §119(e) to U.S. Provisional Patent No. 61/189,647.

The present application is also related to U.S. Provisional Patent No. 61/196,465, filed Oct. 17, 2008, entitled "VENDING MACHINE USER INTERFACE GUIDE; ELECTRONIC COIN RETURN; AND HINGED DELIVERY BIN". Provisional Patent No. 61/196,465 is assigned to the assignee of the present application and is hereby incorporated by reference into the present application as if fully set forth herein. The present application hereby claims priority under 35 U.S.C. §119(e) to U.S. Provisional Patent No. 61/196,465.

TECHNICAL FIELD

This disclosure is generally directed to consumer product vending machines and more particularly to systems and methods for interfaces for vending machines.

BACKGROUND

A vending machine is a machine that provides various snacks, beverages and other products to consumers by vending products without a cashier. Items sold via vending machines can vary by country and region. Vending machines typically utilize a push button interface that is capable of accepting money in paper or coin form. A consumer may insert coins into a coin acceptor or currency into a bill validator, or a combination of the two. Thereafter, the consumer typically makes a product selection by entering a product identifying code into a keypad on the face of the vending machine. If the amount of money recognized by the machine equals or exceeds the amount of money required to purchase the selected product, the machine proceeds to vend the product to the consumer. However, if the consumer has not entered enough money, or the machine not recognized the entry of enough money, no product will be vended to the consumer.

In some cases, coin acceptors jam up, especially if a bill or other foreign object is inserted into the coin slot. If the coin box is not cleared often enough, coins can fill up past the coin detector, preventing further purchases. Bill validators are also a source of frustration for many customers, especially when they falsely reject a bill that happens to be crumpled, ripped, or dirty.

The consumer may become frustrated or realize that he does not have enough money to make a purchase and choose to recover the money that the consumer previously has entered. The consumer may depress a "coin return" mechanism on the vending machine in an attempt to recover the money already entered. Further, the consumer may be required to depress the "coin return" mechanism repeatedly in order to properly engage the lever arms required to release the entered coins.

Additionally, vending machines require routine maintenance due to wear and as the result of vandalism. Often times, this maintenance is difficult due to the space limitations of the room where the vending machine is located.

SUMMARY

This disclosure provides a system and method for guiding a consumer through a vending machine transaction. This disclosure also provides a system and method for handling coin receiving and return in vending machine transactions. This disclosure also provides a system and method for accessing internal components of a vending machine. This disclosure also provides a system and method for wireless communication between and among vending machines and between vending machines and operational management and service controllers.

According to one embodiment of the present disclosure, a user interface guide directs a user through a vending machine transaction. A visual display provides LED cues that direct a customer to input a minimum monetary amount, make a product selection, confirm the product selection, or receive change or a return of the customer's money if so requested.

In still another embodiment, the present disclosure provides an electronically operated coin return. The coin receiving and return mechanism is responsive to an electronic actuator. When a customer selects a coin return button, a signal is sent to the electronic actuator to send the customer's coins to a coin return tray. Thereafter, the customer can be directed through a visual cue where to retrieve his/her money.

In yet another embodiment, the present disclosure provides an apparatus and method for configuring a delivery pan assembly to assist in reducing the amount of space required to access internal areas within the vending machine. The apparatus and method include a delivery pan assembly coupled to the vending machine via a hinge joint located at the bottom of the delivery pan assembly.

Other technical features may be readily apparent to one skilled in the art from the following figures, descriptions and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of this disclosure and its features, reference is now made to the following description, taken in conjunction with the accompanying drawings, in which:

FIG. 1a is a somewhat simplified illustration of a vending machine according to one embodiment of the present disclosure;

FIGS. 1b and 1c are somewhat simplified illustrations of a vending machine user interface according to one embodiment of the present disclosure;

FIG. 1d is a somewhat simplified illustration of a vending machine controller according to one embodiment of the present disclosure;

FIG. 1e is a flow chart of the operation of a user interface guide according to one embodiment of the present disclosure;

FIGS. 2a, 2b, and 2c depict a somewhat simplified vending machine coin return mechanism according to one embodiment of the present disclosure;

FIGS. 3a, 3b, and 3c illustrate a hinged delivery bin for a vending machine according to one embodiment of the present disclosure; and

FIG. 4 is a schematic system diagram of a vending machine system having wireless communication capability according to one embodiment of the present disclosure.

DETAILED DESCRIPTION

The present disclosure provides a system and method guiding a consumer through a vending machine transaction. This disclosure also provides a system and method for handling coin receiving and return in vending machine transactions. This disclosure also provides a system and method for accessing internal components of a vending machine.

FIG. 1a is a somewhat simplified illustration of a vending machine 100 according to one embodiment of the present disclosure. The vending machine has a product display and storage area 102 and a delivery door 104. Additionally, the vending machine 100 has a user interface area 110. Depiction of the user interface area 110 along one side of the face of the vending machine is exemplary only and should not be construed as limited to this configuration. The user interface area 110 may be located along the left side of the face of the vending machine 100. Additionally or alternatively, the user interface area 110 may be located in any other user-accessible portion of the vending machine 100. While shown adjacent to each other, in other embodiments, subsections of the user interface 110 may be located in different portions of the vending machine 100.

Referring now to FIGS. 1b and 1c, the user interface area (hereinafter “UI”) 110 is disposed on a front face of a control carriage 108 (also referred to as a “monetary slide”). The UI 110 includes a card validator 112 (shown on FIG. 1a), a bill validator 114, and a coin insert 116. Although only these three monetary inputs are shown, it should be understood that any suitable manner and method of payment may be incorporated. The UI 110 also includes a user interface guide 120 (hereinafter “UI guide”). The UI guide 120 may be one (1) unit or may be separated into two (2) or three (3) units. The UI guide 120 includes a first position indicator 120A, a second position indicator 120B and a third position indicator 120C. The UI 110 may be a touch screen display or may include multiple touch screen displays. The first position indicator 120A is a visual Light Emitting Diode (hereinafter “LED”) display. Use of an LED is exemplary and it should be understood that other light emitting sources, such as, but not limited to, incandescent, plasma and fiber-optic sources may be utilized. Different ones of the position indicators 120A, 120B and 120C may utilize different source technologies and display through different wavelength spectrums (i.e., the position indicators 120A, 120B and 120C may each appear to be a different color as light is emitted or reflected via a different wavelength).

The first position indicator 120A is located proximate to the monetary input elements (e.g., the card validator 112, the bill validator 114 and the coin insert 116). In some embodiments, the card validator 112, the bill validator 114, the coin insert 116 and the first position indicator 120A are contained within a first position area 122. The first position indicator 120A indicates a starting position for conducting a vending machine transaction. The first position indicator 120A is preferably located at or near the top of the UI 110. Alternatively, if the UI 110 is horizontally oriented, the first position indicator 120A may be located to the left of the second position indicator 120B for left to right reading languages. Alternatively, the first position indicator 120A may be located to the right of the second position indicator 120B in right to left reading languages.

The position indicators 120A, 120B and 120C may display numerals or characters that indicate the sequence in which they are activated. In some embodiments, the first position indicator 120A may display the numeral “1”, the second position indicator 120B may display the numeral “2”, and the third position indicator 120C may display the numeral “3”. In

other embodiments, the position indicators 120A, 120B and 120C may display the characters “A”, “B” and “C”, respectively.

The first position indicator 120A is responsive to programming instructions (discussed in further detail herein below) such that the first position indicator 120A is illuminated prior to the insertion of money into any one of the card validator 112, the bill validator 114 and the coin insert 116. The first position indicator 120A may be responsive to programming to perform a flashing operation (i.e. an interchange of illumination and non-illumination in a specified sequence) prior to a user initiating a monetary transaction at the vending machine (e.g., insertion of a credit or debit card into the card validator 112, insertion of a bill or bills into the bill validator 114, and insertion of a coin or coins into the coin insert 116). In some embodiments, the first position indicator 120A may be in a steady-on state during idle. In other embodiments, the first position indicator 120A may cycle through two or more colors during idle. It will be understood that insertion of a card into the card validator 112 is exemplary. In other embodiments, the card validator 112 may be a touch-type validator that requires only a touch of the card. In still other embodiments, the card validator 112 may be a contactless validator capable of reading the card without any contact (e.g., optically or by radio frequency). In some embodiments, the card validator 112 may be capable of reading types of monetary cards other than debit and credit cards.

The second position indicator 120B is located proximate to a customer keypad 124. In some embodiments, the second position indicator 120B and the customer keypad 124 are included as part of a selection panel 126 as shown in FIG. 1c. In some embodiments, the second position indicator 120A emits (or reflects in additional and alternate embodiments) light in the same wavelength as a plurality of buttons within the customer keypad 124. In such embodiments, for example, if the plurality of buttons within the customer keypad 124 emit light of a wavelength of approximately 510 nanometers (nm) (i.e. appearing green), then the second position indicator 120A will be configured so as to emit light of a wavelength of approximately 510 nm. The second position indicator 120B indicates a product selection position for conducting a vending machine transaction. The second position indicator 120B is preferably located at or near a middle portion of the UI 110. The second position indicator 120B can be positioned to be below the first position indicator 120A when the UI 110 is vertically oriented. Alternatively, the second position indicator 120B may be located to the right of the first position indicator 120A for left to right reading languages. Alternatively, the second position indicator 120B can be located to the left of the first position indicator 120A in right to left reading languages.

The second position indicator 120B is responsive to programming instructions (discussed in further detail herein below) such that the second position indicator 120B is illuminated in response to the insertion of a minimum amount of money into any one or more of the card validator 112, the bill validator 114 and the coin insert 116. The second position indicator 120B may be responsive to programming instructions to perform a flashing operation (i.e. an interchange of illumination and non-illumination in a specified sequence) in response to the insertion of the minimum amount of money required to purchase at least one product for sale in the vending machine into any one or more of the card validator 112, the bill validator 114 and the coin insert 116. In some embodiments, the second position indicator 120B may be in a steady-on state in response to the insertion of the minimum amount of money required to purchase at least one product for sale in

the vending machine. In other embodiments, the second position indicator **120B** may cycle through two or more colors during idle.

The customer keypad **124** includes a plurality of buttons responsive to physical contact by the consumer. The customer keypad **124** may be a standard numeric keypad or it may be an alpha-numeric keypad. The buttons of the customer keypad **124** are adapted to be illuminated by LED or sources such as, but not limited to, incandescent light and fiberoptic. Each one of the plurality of buttons includes a character, or characters. In one embodiment, the character on each of the plurality of buttons is opaque while the remaining area of each of the plurality of button illuminates. In alternate embodiments, the character illuminates while the remaining area of the button is opaque. Additionally, the customer keypad **124** may be displayed within a touch screen display. In some embodiments, as stated herein above with reference to the second position indicator **120A**, the plurality of buttons of the customer keypad **124** emit a light at a wavelength that is the same as the wavelength of light emitted by the second position indicator **120A**. Further, the buttons of the customer keypad are configured to be of such a size and shape so as to assist a customer in readily recognizing and contacting each one of the plurality of buttons. For example, the buttons of the customer keypad **124** may be large round buttons as well as being illuminated.

The customer keypad **124** is responsive to programming such that, upon the initiation of a selection by the customer, the button, or the area representing the button if part of a touch screen display, illuminates and may remain illuminated. For example, if the customer presses a number on the customer keypad **124**, the number pressed is illuminated. The characters selected by the customer may remain illuminated until the customer confirms the selection (discussed herein below with respect to a “check OK” indicator). Additionally, the characters selected by the customer may be displayed on a video display **127**.

In some embodiments, the video display **127** is a two inch (2") by three and a half inch (3.5") graphic display. The display **127** shows how much money has been entered and may have an internal program for idle periods. The display **127** provides a visual indication of which product identification characters have been entered. Upon entry of the last character of the product identifier, the display **127** directs the customer to press a “check OK” button **128**. For example, if the product identifiers are three-digit numbers, upon entering the third number, the display **127** directs the customer to press the “check OK” button **128**. Further, if a selected product fails to be dispensed, the display **127** directs the customer to make another selection.

After a last character of a product identifier is entered by the customer, the “check OK” indicator **128** flashes. The “check OK” indicator **128** is included as part of the customer keypad **124**. In some embodiments, the “check OK” indicator **128** is located proximate the keypad area of the customer keypad **124**. The “check OK” indicator **128** is responsive to programming such that, upon the customer physically contacting (e.g., pressing, touching) the “check OK” indicator **128**, the vending machine **100** commences a vend process.

The customer confirms that the correct product identifier has been entered by pressing the “check OK” indicator **128**. Thereafter, the vending machine activates a dispensing mechanism corresponding to the product identifier in order to release the selected product. As the product is released from a product tray, the product is deposited into a delivery bin (not illustrated in FIG. 1a). The product within the delivery bin is accessible via the delivery door **104**.

If the customer determines that the correct product identifier was not entered, the customer may press (i.e. physically contact) a cancel key **130**. The cancel key **130** is included within the customer keypad **124**. In some embodiments, the cancel key **130** is located proximate the customer keypad **130** or in another location. The cancel key **130** is responsive to programming such that the cancel key **130** illuminates upon the entry of any character of a product identifier. Selection of the cancel key **130** removes the entry of the product identifier from a memory (discussed in more detail herein below) and from the display **127**.

Additionally, prior to confirming the selection by depressing the “check OK” indicator **128**, the customer may request that the vending machine **100** return the customer’s money. The customer may request that the money inserted during the initiation of the transaction be returned by depressing a coin return key **132**.

The coin return key **132** is included within the customer keypad **124**. In some embodiments, the coin return key **132** is located proximate the customer keypad **130** or in another user-accessible location. The coin return key **132** is responsive to programming such that the coin return key **132** illuminates upon the entry of money into the coin insert **116**. Selection of the coin return key **132** removes the entry of the product identifier from a memory, if entered (discussed in more detail herein below). Pressing the coin return key **132** causes the vending machine **100** to return any money inserted into the coin insert **116**. In some embodiments, depressing the coin return key **132** results in the vending machine **100** cancelling the initiation of any transaction resulting from reading a debit or credit card at the card validator **112** or returning any bills inserted into the bill validator **114**.

Upon a request by a customer to return money inserted into the coin insert **116**, the third position indicator **120C** illuminates. The third position indicator **120C** is located proximate a coin return tray **134**. The third position indicator **120C** is responsive to programming (discussed in further detail herein below) such that the third position indicator **120C** is illuminated in response to the return of money inserted into the coin insert **116**. Alternatively, the third position indicator **120C** can be responsive to programming to perform a flashing operation (i.e. an interchange of illumination and non-illumination in a specified sequence) in response to the return of money inserted into the coin insert **116**.

Additionally, if the customer inserts more money than is required to purchase the desired product, the third position indicator **120C** is responsive to programming such that the third position indicator **120C** is illuminated when excess money (e.g., change from the sale) is returned to the customer. For example, the customer inserts one dollar (\$1.00) and selects a product for sale at seventy-five (75) cents. In response, the product is dispensed, twenty-five (25) cents is placed in the coin return tray **134** and the third position indicator **120C** is illuminated.

Referring now to FIG. 1d, a somewhat simplified illustration of a vending machine controller **150** according to one embodiment of the present disclosure is depicted. One embodiment of the controller **150** that may be used to operate the UI guide **120** is illustrated. The device **150** may be a computer, or any other device capable of transmitting, processing, and/or receiving signals via wireless and/or wireline communication links. The device **150** includes a central processing unit (“CPU”) **152**, a memory unit **154**, an input/output (“I/O”) device **156**, and a network interface **158**. The network interface may be, for example, one or more network interface cards (NICs) that are each associated with a media access control (MAC) address. The components **152**, **154**,

156, and **158** are interconnected by one or more communication links **160** (e.g., a bus). It is understood that the device **150** may be differently configured and that each of the listed components may actually represent several different components. For example, the CPU **152** may actually represent a multi-processor or a distributed processing system; the memory unit **154** may include different levels of cache memory, main memory, hard disks, and remote storage locations; and the I/O device **156** may include monitors, keyboards, and the like. Alternatively, single components may be utilized for two or more of the components illustrated.

The network interface **158** enables the device **150** to connect to a network, such as the wireless network of FIG. 4. Network connectivity may allow different functions of the vending machine **100** to be remotely operated or programmed. For example, remote programming transmitted through the network interface **158** may cause the video display **127** to display certain messages, such as promotional messages. As another example, the position indicators **120A-120C** may be remotely programmed to change colors to reflect a holiday or event. Likewise, remote operation instructions transmitted through the network interface **158** may allow any or all of the card validator **112**, the bill validator **114** and the coin insert **116** to be reset or reprogrammed. Similar functions may be available through I/O device **156**.

Memory unit **154** contains programming instructions adapted to be utilized by the CPU **152** to direct the UI **110** through the operation of the functions of the first position indicator **120A**, second position indicator **120B**, third position indicator **120C**, display **127**, customer keypad **124**, "check OK" indicator **128**, cancel key **130**, and coin return key **132**. Memory unit **154** is further adapted to store inputs received from the customer keypad **124** for illustration of selected product via display **127** and illumination of depressed characters on customer keypad **124**.

Referring now to FIG. 1e, a flow chart of the operation of the UI guide according to one embodiment of the present disclosure is illustrated. Flow starts at **162** wherein the first position indicator is flashing. In other embodiments the first position indicator **120A** may be steady illuminated. In still other embodiments, the first, second and third position indicators **120A**, **120B** and **120C** flash in a programmed sequence. In yet other embodiments, a visual cue is displayed by display **127** or the position indicators **120A-C** so as to attract a prospective customer to make a purchase. In such embodiments, the visual cue can be an animation that is designed to attract the attention of potential consumers.

When a customer decides to make a purchase, the customer may begin by inserting in step **164** any one of a debit or credit card into the card validator **112**, a dollar bill into the bill validator **114**, and a coin into the coin insert **116**. It will be understood that the value of the dollar bill is exemplary and that various embodiments provide for the insertion of currency in other amounts that can be detected and determined by the bill validator. Thereafter, the UI guide proceeds, in step **170**, to steady illuminate the first position indicator **120A**.

However, prior to insertion of money in step **164**, the customer may proceed to press numbers on the customer keypad in step **166**. In such scenario, the UI guide moves to step **168** wherein the first position indicator is illuminated and the display broadcasts a textual message indicating that the customer must first insert money prior to making a selection. The UI guide remains at this prompt until the customer inserts any one of a debit or credit card into the card validator **112**, a dollar bill into the bill validator **114**, and a coin into the coin insert at step **164**.

Once the customer has inserted a minimum amount of money (or inserted a card into the card validator **112**) to make a purchase of at least one product in the vending machine, the second position indicator **120B** flashes in step **172**. Thereafter, the customer is directed by the flashing second position indicator **120B** and the display **127** to enter a product identifier via the customer keypad in step **174**. The customer may continue to insert more money as required for the desired purchase, or the customer may proceed to make a selection by entering the product identifier. As the customer enters the product identifier, the character corresponding to the entered number is illuminated in step **176**. For example, if the customer depresses a position on the customer keypad corresponding to the number "4", the character at the number "4" position on the customer keypad illuminates. Additionally, as the customer enters the product identifier, the characters entered are displayed in step **178** via the display **127**. For example, if the customer depresses the product identifier "444", the customer keypad will illuminate the "4" character position. However, the product identifier "444" will be displayed via the display **127**. As such, the customer will be able to visually verify that the number "444" was entered and not just the number "4".

After entry of a minimum numbers of characters necessary to identify a product for selection, the "check OK" indicator **128** is illuminated in step **180**. The customer is thereby provided the opportunity to confirm that the product identifier corresponding to the desired product has been correctly entered.

If the customer determines that the incorrect product identifier was entered, or if the customer changes his/her mind about the desired purchase, the customer may depress the cancel key **130** in step **182**. Thereafter, the entered product identifier is cleared from memory **154** in step **184** and the UI guide process returns to step **174** for entry of another product identifier.

If the customer determines that correct product identifier was entered, the customer depresses the "check OK" identifier **128** in step **185**. Depressing the "check OK" identifier **128** confirms the selection and commences the vend process in step **186**.

During the vend process, a vend sensing system in the vending machine **100** may indicate to the controller **150** that the selected product was not successfully dispensed. For example, the product may be stuck in the tray, or the dispensing mechanism corresponding to the product may be inoperative. The status of the vend sensing system may be checked in step **188**. If the product is not provided to the customer, a count is incremented by one (1) in step **190**. The process checks the number of failed attempts in step **192**. If the number of failed attempts is less than three (3), the process returns to step **186** to attempt to vend the product again. If the number of failed attempts is three (3), the memory **154** is cleared of the product identifier, the customer is informed that the selected product is unavailable and the process returns to step **174** where the customer may enter another selection. It will be understood that three failures is exemplary and the vend process check maximum failures can be set to any specified number of failures.

However, if the vend process is successful, the customer is able to obtain the selected product. Thereafter, the UI guide process returns to the idle state at **162**. Additionally, if change is returned to the customer because more money was deposited than required, the UI guide process transitions to step **196**. In step **196**, the change is deposited in the coin return tray **134** and the third position indicator **120C** illuminates in step **198**.

Additionally, anytime after the customer has inserted money into the coin insert **116**, the coin return key **132** is illuminated and the customer is provided the capability of requesting that the inserted money be returned. The customer presses the coin return key **132** at step **194**. Thereafter, the customer's money is returned in step **196** via the coin return tray **134**. In some embodiments, the third position indicator **120C** is illuminated to direct the customer to retrieve his/her money in step **198**. If the customer inserted a credit card into the card validator **112**, the third position indicator illuminates indicating that the transaction has been cancelled. If the customer inserted one or more bills into the bill validator **114**, the third position indicator **120C** and/or the display **127** may be set to indicate that the money is being returned as coins via the coin return tray **134** or as in currency via the bill validator **114**.

Referring now to FIGS. **2a**, **2b**, and **2c**, a somewhat simplified electronic vending machine coin return system **200** according to one embodiment of the present disclosure is illustrated. The coin return system **200** is disposed within the control carriage **108**. In one embodiment, the coin return system **200** is accessible for maintenance by sliding the control carriage **108** forward via rails attached to a housing of the vending machine **100**.

The coin return system **200** comprises a coin receiving and dispensing mechanism **202**. A coin return lever (or other actuator) **216** (shown in FIG. **2c**) of the coin receiving and dispensing mechanism **202** is mechanically coupled to a coin return motor **204**. The coin return motor **204** is electrically coupled to the controller device **150**. The coin return motor **204** may be an electrically controlled actuator.

FIG. **2b** depicts an exploded view of the coin receiving and dispensing mechanism **202** from another angle, according to one embodiment. FIG. **2c** depicts an assembled view of the coin receiving and dispensing mechanism **202**, according to one embodiment. The coin return motor **204** is held adjacent to the coin receiving and dispensing mechanism **202** by a bracket **210**. The coin return motor **204** and the bracket **210** are secured to the coin receiving and dispensing mechanism **202** by one or more fasteners, such as screw **208**. One or more nuts, such as nut **206**, are configured to fit the screws, such as the screw **208**. A cam **212** is coupled to the coin return motor by a cam coupling **214**. In certain embodiments, the cam **212** is approximately an eccentric circle. In other embodiments, the cam **212** may be approximately elliptical or another shape. When the coin return motor **204** is activated, the cam **212** is driven by the coin return motor **204** to rotate about an axis substantially collinear with the cam coupling **214**.

When a customer depresses the coin return key **132**, the key press is detected by the controller device **150**. In response to the detection, the controller device **150** sends a signal to activate the coin return motor **204**. Activation of the coin return motor **204** rotates the cam **212**, which presses the coin return lever **216**, causing any coins contained within a holding tray of the coin receiving and dispensing mechanism **202** to be released via a path coupled to the coin return tray **134**.

Although the embodiment of the coin return system **200** described above utilizes a motor and cam, such an embodiment is exemplary and is not limiting. It will be understood by those of skill in the art that other mechanisms are possible. For example, in another embodiment, the coin return system **200** may include a solenoid that is mechanically coupled to the coin return lever of the coin mechanism **202** and electrically coupled to the controller device **150**. Upon receiving a signal from the controller device **150**, an armature in the solenoid may move to press the coin return lever of the coin mechanism **202**, thus releasing the coins in the holding tray of the coin mechanism.

Referring now to FIGS. **3a**, **3b** and **3c**, a delivery bin **300** for the vending machine **100** according to one embodiment of the present disclosure is depicted. The delivery bin **300** is coupled to a housing of the vending machine **100** via a hinged joint **302**. The hinged joint **302** is located on the bottom edge of the front of the delivery bin **300**. The hinged joint **302** couples the delivery bin **300** to a bottom front edge of the housing of the vending machine **100**.

The vending machine **100** includes a bin storage area **310**. The bin storage area **310** is located beneath a lowermost product display trays **312**. The bin storage area **310** is accessible by rotating the delivery bin **300** about the hinged joint **302**.

A door **314** coupled to the housing of the vending machine **100** via a hinged joint **316** provides access to the product display trays **312**. The hinged joint **316** is located on a vertical edge of the door **314**. The hinged joint **316** couples the door **314** to a portion of a vertical front edge of the vending machine **100** housing.

The UI **110** is disposed on the face of a control carriage **318**. The control carriage **318** is attached to the housing of the vending machine **100** via a glide assembly **320**. The glide assembly **320** enables the control carriage **318** to slide forward, outward from the housing of the vending machine **100**. Sliding the control carriage **318** provides access to internal components of the UI **110**, money collected by the vending machine **100**, and a delivery bin latching mechanism **322**.

The delivery bin latching mechanism **322** is an interlock that secures the delivery bin **300** in an upright, i.e., dispensing position. In certain embodiments, a user wishing to open the delivery bin **300** first opens the door **314**, slides the control carriage **318** forward, and then operates the delivery bin latching mechanism **322** to tilt the delivery bin **300** downward. Support control rods **324** coupled to the side of the delivery pan assembly **300** provide support when the delivery bin **300** is in the open (down) position.

The delivery bin **300** requires a specified depth in order to receive, contain, and provide subsequent access to, products vended for consumers. Previously, a delivery bin was attached to the door (for example door **314**) and swung out with the opening of the door. The delivery bin door **104** is located on the face of delivery bin **300** to provide access to the vended products. Rotation of the delivery bin **300** downward (i.e., locating the hinge joint **302** at the bottom edge of the delivery bin **300**), results in the elimination of a side rotation radius that would have been required had the hinge joint **302** been located on a vertical side of the delivery bin **300**. For example, if the hinge joint **302** were located on the same vertical side as the hinge joint **316**, opening the delivery pan assembly **300** would require additional space along the side adjacent the control carriage **318** to allow for the depth of the delivery bin **300** to rotate out of the vending machine **100** housing. The product displays trays **312** are set back within the vending machine **100** housing to allow for a product released from the product display trays **312** to drop into the delivery bin **300**. The set back of the display trays **312** provides sufficient clearance for the delivery bin **300** to rotate downward without adjusting the exterior dimensions of the vending machine **100** housing.

Referring to FIG. **4**, vending machines **402**, **404** and **406** according to the present disclosure communicate wirelessly with each other. In one embodiment, the vending machines **402**, **404** and **406** are located adjacent to each other and only the machine **402** has a user interface: e.g., coin/currency acceptor and/or dispenser mechanisms, selection buttons, and display apparatus. A user may select a product located in the vending machine **404** by operating the selection buttons on

the machine 402 and the machine 402 will send a wireless message to the machine 404 to cause the machine 404 to dispense the product. Where the machine 404 has a product delivery sensing system, the machine 404 may send a wireless message to the machine 402 indicating whether the product was successfully vended, and the machine 402 may offer the opportunity to select another product or return the customer's money.

The vending machines 402, 404 and 406 may exchange setup information via wireless messages. Such setup information may include numbers of shelves, numbers of product queues on each shelf, numbers of products in each queue, product price for each product queue, or other information. In an embodiment where only one machine has a user interface, such setup information may enable that machine to provide menu and selection choices for products in the other machines.

The machines 402, 404 and 406 may exchange operational status information via wireless communication. Such operational status information may include current inventory in each product queue, cumulative count of number of activations of a product queue dispenser, time since last servicing call, required maintenance, detected electronic or mechanical failures, or other information.

Other devices may additionally or alternatively communicate wirelessly with one or more of the vending machines 402, 404 and 406. A portable computer 416 communicates wirelessly with the machine 402 and may be used by a technician to provide setup information when the vending machines 402, 404 and/or 406 are installed, reconfigured or restocked. A technician in a service van 412 communicates wirelessly with the machine 402 from outside the building where the machine is located to determine whether service on one or more of the machines 402, 404 and 406 is required and, if so, what kind of service. A technician may also communicate wirelessly with the machine 402 to check operational status, such as whether the electronic coin return system 200 is performing correctly, or whether the delivery bin 300 is securely latched into an upright position.

Where the facility in which the vending machines 402, 404 and 406 are located has a wireless access point 414, the machine 402 communicates wirelessly through the access point 414 to a device 420 coupled to the access point 414 via a network 422 (e.g., Internet or another communication network). The device 420 may be a remotely located central server or other controller for an operator of a number of such vending machines. Through the use of a device 420, the operator may achieve a benefit such as avoiding the cost of sending a technician to the location of the vending machines 402, 404 and 406 to obtain operational status information.

In some embodiments, the vending machine 402 is capable of cellular communication. In such embodiments a personal digital assistant (PDA) 418 or other cellular-capable device may "call" the machine 402 at its cellular phone number to establish wireless communication via a base station 410 in order to send setup information or receive operational status information. Similarly, the base station 410 may be coupled to the network 422, allowing the device 420 to communicate with the vending machine 402 via the base station 410.

The wireless communication between the vending machine 402 and any one or more of the portable computer 416 the wireless access point 414, and the vehicle 412 may use the IEEE 802.11 standard (referred to as a "WiFi standard"), the IEEE 802.16 standard (referred to as a "WiMAX standard"), or any other suitable wireless communications interface standard. The machines 402, 404 and 406 may form a wireless ad hoc network or other mesh network. In other

embodiments, communication between the vending machine 402 and the base station may be conducted under another standard than a cellular wireless standard.

While only the vending machine 402 is shown communicating wirelessly with the portable computer 416 the wireless access point 414, and the vehicle 412, it will be understood that any or all of the machines 402, 404 and 406 may provide such communication. In embodiments where setup and/or operational status information are located in the machine 402, another machine, such as vending machine 406, may provide wireless communication to an external device, such as the portable computer 416. In such an embodiment, status information is wirelessly communicated from the machine 402 to the machine 406 and then wirelessly communicated to the portable computer 416. Similarly, setup commands and information are wirelessly communicated from the portable computer 416 to the vending machine 402 and then wirelessly communicated to the machine 402.

In some embodiments, an operator may purchase product inventory to stock in the vending machines. In other embodiments, an operator may purchase and install machines that a manufacturer or other entity uses for consignment sales. Where such consignment products have a high price, cash sales may be impractical and the vending machine may be equipped with a card reader to scan credit or debit cards to fund the transaction. In such embodiments, the vending machine uses wired or wireless communication to communicate with a transaction network, independent sales organization, acquiring bank, or other entity to authorize the transaction.

It may be advantageous to set forth definitions of certain words and phrases used throughout this patent document. The term "couple" and its derivatives refer to any direct or indirect communication between two or more elements, whether or not those elements are in physical contact with one another. The terms "transmit," "receive," and "communicate," as well as derivatives thereof, encompass both direct and indirect communication. The terms "include" and "comprise," as well as derivatives thereof, mean inclusion without limitation. The term "or" is inclusive, meaning and/or. The phrases "associated with" and "associated therewith," as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like. The term "controller" means any device, system, or part thereof that controls at least one operation. A controller may be implemented in hardware, firmware, software, or some combination of at least two of the same. The functionality associated with any particular controller may be centralized or distributed, whether locally or remotely.

While this disclosure has described certain embodiments and generally associated methods, alterations and permutations of these embodiments and methods will be apparent to those skilled in the art. Accordingly, the above description of example embodiments does not define or constrain this disclosure. Other changes, substitutions, and alterations are also possible without departing from the spirit and scope of this disclosure, as defined by the following claims.

What is claimed is:

1. A vending machine comprising:
 - a cabinet holding a plurality of product shelves;
 - a cabinet door enclosing a portion of a front of the cabinet;
 - a delivery bin assembly rotatably mounted within the cabinet, the delivery bin assembly including a front face and sidewalls, wherein a portion of the front face and side-

13

- walls define a product receiving area, the product receiving area further defined by a rear wall attached to the sidewalls and a bottom extending between the rear wall and the front face and between the sidewalls, wherein a portion of the front face of the delivery bin assembly includes a delivery bin door configured to provide access to the product receiving area; and
 a hinged joint disposed along a bottom edge of a front of the delivery bin assembly,
 wherein the delivery bin assembly is configured to tilt outward from the cabinet about the hinged joint, to permit access to a portion of the cabinet behind the delivery bin assembly.
2. The vending machine according to claim 1, wherein the door bin door is configured to provide access through the front face of the delivery bin assembly into the product receiving area while the delivery bin assembly is not rotated outward from the cabinet.
3. The vending machine according to claim 1, wherein a storage area behind the delivery bin assembly is accessible when the delivery bin assembly is tilted outward about the hinged joint.
4. The vending machine according to claim 1, further comprising:
 a latching mechanism configured to secure the delivery bin assembly in an upright position within the cabinet.
5. The vending machine according to claim 4, wherein the latching mechanism is accessible when a control carriage is slid forward from the cabinet.
6. The vending machine according to claim 4, wherein the delivery bin door moves with the delivery bin assembly when the delivery bin assembly is rotated.
7. A vending machine, comprising:
 a cabinet forming an enclosure; and
 a delivery bin assembly rotatably mounted within the cabinet, the delivery bin assembly including
 a front face,
 a delivery bin mounted to the front face, and
 a delivery bin door within the front face,
 wherein the delivery bin assembly is rotatable between an upright position within the cabinet and an open position in which the delivery bin assembly is rotated around a bottom edge of the delivery bin assembly outward from the cabinet, and wherein the delivery bin door is configured to permit access to the delivery bin when the delivery bin assembly is in the upright position.
8. The vending machine according to claim 7, wherein the delivery bin door moves with the delivery bin assembly when the delivery bin assembly is rotated from the upright position to the open position.
9. The vending machine according to claim 7, wherein a storage area behind the delivery bin assembly is accessible when the delivery bin assembly is in the open position, but is not accessible when the delivery bin is in the upright position.
10. The vending machine according to claim 7, further comprising:
 a plurality of product shelves mounted within the cabinet above the delivery bin assembly;
 a cabinet door enclosing a portion a front of the cabinet in front of the product shelves and above the delivery bin assembly, wherein products are delivered between the product shelves and the cabinet door to the delivery bin.
11. The vending machine according to claim 7, further comprising:

14

- a hinged joint disposed along a bottom edge of the front face of the delivery bin assembly.
12. The vending machine according to claim 7, further comprising:
 a latching mechanism configured to secure the delivery bin assembly in the upright position.
13. The vending machine according to claim 12, further comprising:
 a control carriage slidably mounted to the cabinet and movable between a retracted position in which the control carriage is within the cabinet and an extended position in which the control carriage protrudes from the cabinet,
 wherein the latching mechanism is accessible when a control carriage is in the extended position.
14. A method of mounting a delivery bin within a vending machine, the method comprising:
 rotatably mounting a delivery bin assembly within a cabinet forming an enclosure, the delivery bin assembly including
 a front face, and
 the delivery bin mounted to the front face,
 wherein the delivery bin assembly is rotatable between an upright position within the cabinet and an open position in which the delivery bin assembly is rotated around a bottom edge of the delivery bin assembly outward from the cabinet; and
 providing a delivery bin door within the front face, wherein the delivery bin door is configured to permit access to the delivery bin when the delivery bin assembly is in the upright position.
15. The method according to claim 14, further comprising:
 configuring the delivery bin door to move with the delivery bin assembly when the delivery bin assembly is rotated from the upright position to the open position.
16. The method according to claim 14, wherein a storage area behind the delivery bin assembly is accessible when the delivery bin assembly is in the open position, but is not accessible when the delivery bin is in the upright position.
17. The method according to claim 14, further comprising:
 mounting a plurality of product shelves within the cabinet above the delivery bin assembly;
 providing a cabinet door enclosing a portion a front of the cabinet in front of the product shelves and above the delivery bin assembly, wherein products are delivered between the product shelves and the cabinet door to the delivery bin.
18. The method according to claim 14, further comprising:
 disposing a hinged joint along a bottom edge of the front face of the delivery bin assembly.
19. The method according to claim 14, further comprising:
 providing a latching mechanism configured to secure the delivery bin assembly in the upright position.
20. The method according to claim 19, further comprising:
 providing a control carriage slidably mounted to the cabinet and movable between a retracted position in which the control carriage is within the cabinet and an extended position in which the control carriage protrudes from the cabinet,
 wherein the latching mechanism is accessible when a control carriage is in the extended position.